INERTIAL CONFINEMENT FUSION
Lawrence Livermore National Laboratory

Monthly Highlights

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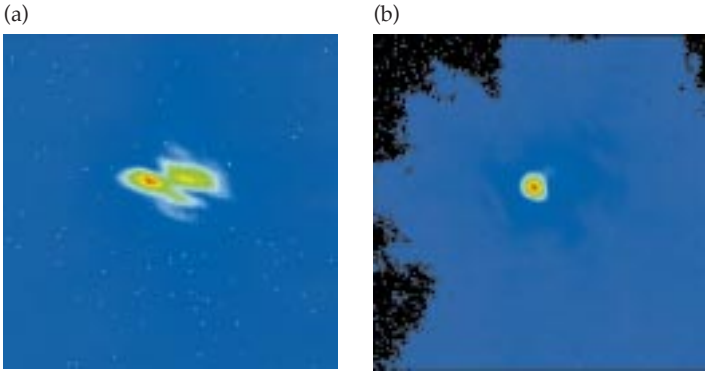
NIF Target Chamber Coming Together. The NIF target chamber assembly began this month inside the special Target Chamber Assembly Building. The target chamber, which is being constructed of 4-inch-thick aluminum, will be a sphere 30 feet across. It is being made of 18 plates that fit together in the same configuration as the panels on a volleyball; the photo below shows the first three panels joined into one piece.

The first three of 18 target chamber sections joined.

NIF Power Conditioning. Sandia National Laboratories in Albuquerque, New Mexico, has completed the assembly of the first article power conditioning module for the NIF. The first article module houses a maximum of 24 capacitors, storing nearly 2 MJ of energy to drive 40 flashlamps. The first article will be thoroughly tested over the next five months to ensure that the system design meets the NIF performance and lifetime requirements.

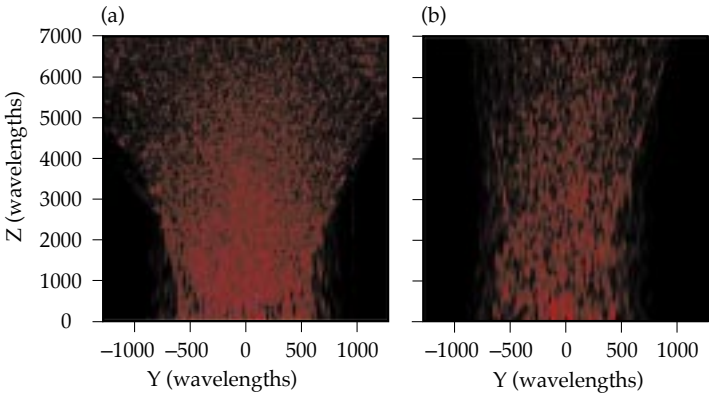
The first article power conditioning module for the NIF has been assembled.

Petawatt Laser Uses Deformable Mirror. The Petawatt laser at LLNL, already the most powerful single-pulse laser in the world, has been operated with an advanced wavefront control system, which has increased its peak focused intensity to more than 3×10^{20} W/cm^2. The new system is based on a deformable mirror (DM) similar to systems developed for AVLIS and NIF. Focal-plane images of the laser beam (shown below) illustrate the improvement afforded by the DM. The DM gives a smaller (8 μm at FWHM), reproducible, rather symmetric focal spot with approximately 30% of the laser energy contained within the central spot. This improved optical performance of the Petawatt laser allows scaling experiments to be extended to higher intensity.



Result (b) shows the dramatically smaller spot size of the Petawatt laser using a deformable mirror, leading to increased intensity.

Parallel Laser–Plasma Hydrocode (pF3D). A unique, massively parallel version of the laser–plasma hydrodynamics code F3D, called pF3D, greatly extends the simulation capability to plasma volumes approaching the size of an entire NIF beam (up to $56 \times 900 \times 2500$ µm). Simulations of filamentation with pF3D show that smoothing by spectral dispersion (SSD) controls beam spraying for NIF-relevant parameters.



pF3D simulation (a) with random phase plate only, and (b) with SSD.

For comments about content of the *Monthly Highlights*, contact Bob Kauffman (925) 422-0419.
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